



INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference F070. 007 .03	FOR FURTHER ACTION See Form PCT/IPEA/416	
International application No. PCT/GB2004/003020	International filing date (day/month/year) 12.07.2004	Priority date (day/month/year) 27.09.2003
International Patent Classification (IPC) or national classification and IPC G01B7/14		
Applicant FUTURE TECHNOLOGIE (R&D) LIMITED et al.		
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 6 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau a total of 2 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p>		
<p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the opinion</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input checked="" type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input type="checkbox"/> Box No. VIII Certain observations on the international application</p>		
Date of submission of the demand 25.07.2005	Date of completion of this report 02.09.2005	
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized Officer Beyfuß, M Telephone No. +49 89 2399-2725 	

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/GB2004/003020

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language , which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4)
 - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

Description, Pages

1-9 as originally filed

Claims, Numbers

1-13 received on 09.08.2005 with letter of 05.08.2005

Drawings, Sheets

1/9-9/9 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☒ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☒ the claims, Nos. 1, with respect to certain amendments
- ☐ the drawings; sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

* If item 4 applies, some or all of these sheets may be marked "superseded."

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Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-13
	No: Claims	
Inventive step (IS)	Yes: Claims	1-13
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-13
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

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The following documents are referred to in this communication:

D1: US-A-5 760 593
D2: US-A-4 604 905
D3: EP-A-0 551 525
D4: US-A-5 247 837
D5: US-A-4 128 776
D6: US-B1-6 171 460

Re item I:

1. The applicant has filed amended claims with his letter of 05/08/05. Some of the amendments of **claim 1** go beyond the disclosure of the originally filed application, contrary to **Article 34(2)(b) PCT**:
2. There is no disclosure in the originally filed application that "the housing (4,106) substantially surrounds the shield (105)".
3. In line 11 there is no disclosure for the term "substantially" which is a vague term and introduces additionally an unclarity (Article 6 PCT).
4. According to Rule 70.2 (c) PCT the International Preliminary Examination Report has been established as if these amendments have not been made. It is added that using a wording according to p. 8, l. 11-12, and deleting "substantially" would overcome the problems listed in above items 2. and 3., respectively.

Re Item V:

1. Technical Field: Capacitive distance sensors
2. Prior Art

D5 and **D6** relate to ceramic-metal composite electrodes and conductive ceramic electrodes in general, respectively. **D1-D4** disclose sensors which provide electrodes made of electrically conductive ceramic. **D4** does not specify the exact materials,

whereas **D2** and **D3** disclose a silicon carbide electrode and a silicon nitride housing. **D1** (Fig. 3; col. 6, l. 1-25; col. 2, l. 47-col. 3, l. 24) which is seen as most relevant prior art discloses a sensor for capacitively measuring the distance to the tip of a turbine blade. In one embodiment the electrode is formed as a conductive ceramic/metal composite (ie. a conductive ceramic electrode) surrounded by a ceramic layer which forms a housing. Moreover, the sensor of **D1** has a shield between electrode and housing, formed as a platinum/iridium layer.

3. Novelty (Article 33(2) PCT)

The subject matter of claim 1 differs from the sensor of **D1** in that the shield is formed entirely from an electrically conductive ceramic material. **The subject matter of independent claim 1 is thus new.**

4. Inventive Step (Article 33 (3) PCT)

Providing a conductive ceramic shield provides a better adaptation to the neighboured materials, in particular with respect to thermal expansion. Although **D1** refers in some passages to the problem of thermal expansion mismatch for high temperature applications, it still uses a thin (0.3mm) metallic shield formed by deposition. Neither in **D1** nor in any other available prior art an indication was found to replace the thin metal shield by a ceramic conductive layer. In **D1-D4** the conductive ceramic is used for bulky parts which would require further modifications to fit in the general approach of **D1** to use thin layers. **Accordingly, the subject matter of independent 1 is also based on an inventive activity.**

5. Dependent Claims

The dependent claims 1 to 12 only add particular features to the subject matter of independent claim 1. **The subject matter of claims 2 to 13 is thus also new and based on an inventive step.**

6. Industrial Applicability (Article 33(4) PCT)

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The subject matter of claims 1-13 is industrially applicable, eg. for inspecting gas turbines.

CLAIMS

1. A sensor (1,100) for capacitively measuring the distance to a stationary or passing object comprising an electrode (2, 102) for capacitively coupling with the object, a shield (105) that surrounds the electrode (102) and is electrically isolated from the electrode (102) by an insulating layer (104), and a housing (4, 106) that substantially surrounds the electrode (2, 102) and the shield (105),

wherein the electrode (2, 102) and the shield (105) are formed entirely from an electrically conductive ceramic material and the insulating layer (104) and the housing (4, 106) are formed entirely from an electrically non-conductive ceramic material, and in that the electrically conductive and electrically non-conductive ceramic materials are selected to have substantially similar thermal expansion coefficients.

2. A sensor according to claim 1, wherein the shield (105) is formed from a solid piece of electrically conductive ceramic.

3. A sensor according to claim 1, wherein the shield (105a) is a deposited electrically conductive ceramic layer.

4. A sensor according to claim 3, wherein the shield (105a) is deposited onto the inside surface of the housing (4, 106).

5. A sensor according to any preceding claim, further comprising:
a first electrically conductive bridge (5) connected to the electrode (2) and connectable to the conductor of a transmission cable; and
a second electrically conductive bridge (7) connected to the housing (4) and connectable to the conductor of a transmission cable.

6. A sensor according to claim 5, wherein the first electrically conductive bridge (5) passes through apertures provided in the housing (4) and the second electrically conductive bridge (7).

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7. A sensor according to claim 5 or claim 6, wherein the second electrically conductive bridge (7) substantially surrounds the housing (4).
8. A sensor according to any of claims 5 to 7, further comprising an adaptor (30, 40) for connecting the second electrically conductive bridge (7) to the conductor of a transmission cable.
9. A sensor according to any of claims 5 to 8, further comprising a third electrically conductive bridge (109) connected to the shield (105) and connectable to the conductor of a transmission cable.
10. A sensor according to claim 9, wherein the first electrically conductive bridge (107) passes through apertures provided in the insulating layer (104), the shield (105), the third electrically conductive bridge (109), the housing (106) and the second electrically conductive bridge (111), and wherein the third electrically conductive bridge (109) passes through apertures provided in the housing (106) and the second electrically conductive bridge (111).
11. A sensor according to claim 9 or claim 10, further comprising an adaptor (60,70) for connecting the second electrically conductive bridge (111) to the conductor of a transmission cable and the third electrically conductive bridge (109) to the conductor of a transmission cable.
12. A sensor according to any preceding claim, wherein one or more of the electrode (102), shield (105), insulating layer (104) and housing (106) are bonded together.
13. A sensor according to claim 12, wherein the bonding provides a hermetic seal between the one or more of the electrode (102), shield (105), insulating layer (104) and housing (106).